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Christian Schmidt

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EXAMINER

JENNISON, BRIAN W

ART UNIT

PAPER NUMBER

3742

NOTIFICATION DATE

DELIVERY MODE

11/26/2010

ELECTRONIC

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

USPTO@pczlaw.com  
Arch-USPTO@pczlaw.com

<b>Office Action Summary</b>	<b>Application No.</b> 10/594,991	<b>Applicant(s)</b> SCHMIDT, CHRISTIAN	
	<b>Examiner</b> BRIAN JENNISON	<b>Art Unit</b> 3742	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 25 June 2010.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-15, 17-19, 21-25, 27-51, 75 and 76 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-15, 17-19, 21-25, 27-51, 75 and 76 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)                                | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftperson's Patent Drawing Review (PTO-948)                        | 5) <input type="checkbox"/> Notice of Informal Patent Application                       |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

***Claim Rejections - 35 USC § 103***

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims 1-2, 5-15, 17-19, 32-35, 41-44, 46-50, 75-76 are rejected under 35 U.S.C. 103(a) as being unpatentable over Cross (US 4,777,338) in view of Takagi et al (US 6,348,675).

Cross teaches:

Regarding Claim 1: A method of forming a structure, preferably a hole or cavity or channel, in a region of an electrically insulating substrate, (A perforation in a film is made. See Column 2, Lines 64-68.) comprising the steps:

- a) providing an electrically insulating substrate, (the film is provided in Fig 1)
- b) applying, by means of a voltage supply, a voltage across a region of said electrically insulating substrate, said voltage being sufficient to give rise to a significant increase in electrical current through said region and to a dielectric breakdown (DEB) through said region, (A voltage supply 36 applies an electric pulse or current causing dielectric breakdown of the film which does not break the film. See Column 3, Lines 5-10.)
- c) applying energy, preferably heat, to said substrate or said region only so as to increase the temperature of said region, said energy, preferably heat, originating either from an energy or heat source or from components of said voltage applied in step b),

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said energy, preferably heat, being applied so as to reduce the amplitude of voltage required in step b) to give rise to said current increase and/or to soften the material of said region, (Heat is generated by the current applied to the electrodes from the power supply which soften the material. See Column 4, Lines 35-40. The high temperature bath also allows for heating. See Column 3, Lines 39-45.) The first electrode is placed on one side, being the left side and the second electrode is placed on another side being the right side.

Cross fails to teach:

Regarding Claim 1: wherein step b) is performed and, preferably, ended using an electronic feedback mechanism operating according to user-predefined parameters, said electronic feedback mechanism controlling the properties of said applied voltage and/or of said electrical current wherein said electronic feedback mechanism comprises a current and/or voltage analysis circuit, alone or as part of a user-programmed device, said current and/or voltage analysis circuit controlling voltage supply output parameters, and/or controlling said energy, or heat if present.

Takagi teaches:

Regarding Claim 1: an electronic voltage feedback mechanism 7 which measures voltage and sends a signal to the pulse generator which would be controlling the energy or heat. It would have been obvious to adapt Cross in view of Takagi to include the

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electronic feedback signal for controlling the amount of voltage and in turn, heat, to the substrate.

Cross also teaches:

Regarding Claim 2: This is merely an increase in current as defined by the definition of current. Dielectric breakdown is caused by the increase in current and voltage in the electrode from the trigger 42 during a predefined period of 1 microsecond or less. See Column 3, Lines 50-55.

Regarding Claim 5: The trigger circuit is capable of ending the voltage and current supplied in 100ns to 10us after dielectric breakdown.

Regarding Claim 6: The pulse occurs for 1 micro second and then the step of applying voltage and current ends when the pulse ends. See Column 6, Lines 40-45.

Regarding Claim 7: The pulse is controlled by the trigger circuit and occurs without user intervention. See Column 5, Lines 8-12.

Regarding Claim 8: The feedback mechanism is a trigger circuit 42 and is capable of controlling voltage.

Regarding Claim 9: The heat from the water and the voltage are applied at the same time.

Regarding Claims 10-11: These claims simply make the method non automatic and may be done by turning a knob or changing the circuit which involves a user.

Regarding Claim 12: The trigger circuit regulates the duration and frequency of voltage. See Column 5, Lines 9-11.

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Regarding Claim 13: The voltage is 15,000V. See Column 4, Line 44.

Regarding Claim 14: The heat of the bath is applied before the voltage. See Column 3, Lines 39-45.

Regarding Claim 15: The film is in the heated water bath after the current is applied. See Column 4, Lines 35-40.

Regarding Claim 17: The voltage is increased so that dielectric breakdown and spark gaps occur. See Column 5, lines 15-25.

Regarding Claim 18: The current flows from electrode to electrode causing dielectric breakdown which would change the stiffness or brittleness of the substrate. See Column 5, Lines 15-25.

Regarding Claim 19: The discharge melts part of the substrate. See Column 1, Lines 10-15.

Regarding Claim 32: the water bath provides heat and the power consumption is reduced, Meaning voltage amplitude is reduced. See Column 4, Lines 15-20.

Regarding Claim 33-34: When voltage is applied to the electrode it creates heat on the substrate. The conductors 19 can be considered heated filaments since the current pass through them will cause them to heat up.

Regarding Claim 35: The water bath is considered and external heat source.

Regarding Claims 41-42: The hole has a diameter of 50 microns. See column 6, Lines 5-10.

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Regarding Claim 43: The perforations are formed in channel like structures. The film is moved along the electrode; therefore the electrodes are moved relative to the film. See Column 6, Lines 5-10.

Regarding Claim 44: The hole is 50 microns in diameter and the depth is 1 mm given the structure and aspect ratio of greater than 5. See Column 6, Lines 5-10.

Regarding Claim 46: The thickness of the region is 1mm, which is greater than 10 microns. See Column 6, Lines 5-10.

Regarding Claim 47: The substrate is in a conductive liquid, water, which reacts with the surface during the process to facilitate dielectric breakdown. See Column 3, Lines 35-45.

Regarding Claim 48: The water bath facilitates smoothing of the surface since the temperature is increased to shrink the hole. See Column 6, Lines 5-10. The erosive properties of water will also smooth the surface.

Regarding Claim 49: The diameter of the hole is changed through an increase in temperature of the heated water. See Column 6, Lines 5-10.

Regarding Claim 50: Any electric arc created by the two electrodes in Fig 1 will give off heat and will facilitate the heating of the substrate. See Column 5, Lines 25-30.

Regarding Claim 75: arcs occur between the electrodes which would generate heat.

Regarding Claim 76: dielectric breakdown occurs with no breakage of the substrate meaning, the film remains in tact. (See Column 3, Lines 20-25)

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5. Claims 3-4, 21-25, 27-30, 36-40, 51 and 77 are rejected under 35 U.S.C. 103(a) as being unpatentable over Cross as modified by Takagi in view of Davies et al (US 3,760,153.)

The teachings of Cross as modified by Takagi have been discussed above.

Cross also teaches:

Regarding Claims 24, 40: The time the pulse is applied is 1 microsecond giving it a frequency of  $1 \times 10^6$  Hz. See Column 6, Lines 40-45.

Regarding Claims 36-38: Heat is applied by the electrode since it is dissipated when voltage is applied. Fig 1 shows the electrodes 60, 62 being placed on opposite sides of the substrate.

Regarding Claim 39: Dielectric breakdown from voltage application. See Column 3, Lines 5-10.

Regarding Claim 29: When dielectric breakdown occurs the temperature in the region of the breakdown will increase.

Regarding Claim 30: Any increase of current will cause the path to be a more direct line.

Cross as modified by Takagi fails to teach:

Regarding Claim 3: The method wherein said significant increase in electrical current is an increase in the number of charge carriers per unit time, by a factor of 2, preferably by at least one order of magnitude.



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Regarding Claim 4: The method according to claim 2, wherein said electronic feedback mechanism causes said end of step b) to occur--with or without a preset delay--at the time when said electrical current has reached a threshold value, preferably in the range of 0.01 to 10 mA, or at the time, when an increase in electrical current,  $(dI/dt)$ , has reached a threshold value, preferably equal or larger than 0.01 A/s.

Regarding Claim 21: The method according to claim 1, wherein said applied voltage is purely DC.

Regarding Claims 22 and 77: The method according to claim 1, wherein said applied voltage is purely AC.

Regarding Claim 23: The method according to claim 1, wherein said applied voltage is a superposition of AC and DC voltages.

Regarding Claim 24: The method, wherein the frequency of said applied AC voltage is in the range...

Regarding Claim 25: The method, wherein said AC voltage is applied intermittently, preferably in pulse trains of a duration in the range of from 1 ms to 1000 ms, preferably 10 ms to 500 ms, with a pause in between of a duration of at least 1 ms, preferably of at least 10 ms.

Regarding Claim 27: The method according to claim 22, wherein said applied AC voltage has parameters (e.g. amplitude, frequency, duty cycle) which are sufficient to establish an electric arc between a surface of said substrate and said electrodes.

Regarding Claim 28: The method according to claim 27, wherein said electric arc is used for performing step c).

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Regarding Claims 29, 30, 36, 37, 39-40: AC voltage

Regarding Claim 51: The voltage applied is 10kV and may drop to 300V without additional heating.

Davies et al teaches:

Regarding Claims 3 and 4: The current at breakdown is 0.5 amps and decays to  $10^{-12}$  A which means the current is increased at least one order of magnitude. See Column 7, Lines 40-43.

Regarding Claim 25: A discharge time of 50 milliseconds, which is at least 10ms. See Column 7, Lines 14-15.

Cross as modified by Takagi discloses the claimed invention except for the current increases and duration. It would have been obvious to one of ordinary skill in the art at the time of the invention was made to increase the current by a certain order of magnitude and for a certain duration since Davies teaches increasing a current to a certain value for ending a step and maintaining the pulse for 50 milliseconds, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or working ranges involves only routine skill in the art. (In re Aller, 105 USPQ 233.)

Regarding Claims 21-23, 36, 37, 39-40 and 77: AC or DC voltage may be used as well as DC superpositioned on AC. See Column 3, Lines 30-35.

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Regarding Claim 26: Since AC is used throughout the process it will also be used when heat is applied.

Cross as modified by Takagi discloses the claimed invention but fails to specify AC or DC. It would have been obvious to one of ordinary skill in the art to use AC, DC or both since Davies et al teaches it is known in the art that AC and/or DC may be used to supply power.

Regarding Claims 27-28: The arc is created for 8 milliseconds and would also create an energy which is applied to the substrate during the arc. See Column 7, Lines 25-30.

Cross as modified by Takagi discloses the claimed invention except for AC parameters for creating an arc. It would have been obvious to one of ordinary skill in the art at the time of the invention was made to create an AC current to establish an arc, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or working ranges involves only routine skill in the art. (In re Aller, 105 USPQ 233.)

Regarding Claim 31: The arc is created every 4 milliseconds and has a certain frequency to create holes at a specific distance. If the time of the frequency of the arc is increased the arc will occur more frequently and the holes will be spaced closer together. This is simply a design choice and can be realized using simple calculations.

Cross as modified by Takagi discloses the claimed invention except for increasing the frequency of the arc. It would have been obvious to one of ordinary skill in the art at the time of the invention was made to increase the frequency of the arc to minimize the distance between the holes, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or working ranges involves only routine skill in the art. (In re Aller, 105 USPQ 233.)

Regarding Claim 45: The substrate may be a polyester film which is a carbon based polymer. See Column 7, Lines 43-46.

Cross as modified by Takagi discloses the claimed invention except for a carbon based polymer substrate. It would have been obvious to one having ordinary skill in the art at the time the invention was made to use a polyester film substrate as taught by Davies et al, since it has been held to be within the general skill the art to select a known material on the basis of its suitability for the intended use as a matter of obvious design choice.

Regarding Claim 51: The voltage applied is 10kV and may drop to 300V without additional heating.

Cross as modified by Takagi discloses the claimed invention except for the voltage being 10kV as taught by Davies et al. It would have been obvious to one of ordinary skill in the art at the time of the invention was made to use a voltage of 10kV, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or working ranges involves only routine skill in the art. (In re Aller, 105 USPQ 233.)

### ***Response to Arguments***

2. Applicant's arguments with respect to claims 1-15, 17-19, 21-25, 27-44, 46-51, 75-76 have been considered but are moot in view of the new ground(s) of rejection. The newly added claims have been addressed above including applicant's arguments towards dielectric breakdown.

### ***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to BRIAN JENNISON whose telephone number is (571)270-5930. The examiner can normally be reached on M-Th 9am-5pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, TU HOANG can be reached on 571-272-4780. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/BRIAN JENNISON/  
Examiner, Art Unit 3742

11/18/2010

/Mark H Paschall/  
Primary Examiner, Art Unit 3742